The new claims contain 8 (eight) independent claims and 38 (thirty-eight) dependent claims. A fee for 38 (thirty-eight) excess claims over 20 is enclosed.

The new claims herein submitted contain no new matter, and fall completely within the scope of the material set out in the originally filed documents.

I claim:

21. An apparatus for determining an anticipated fully charged or nearly discharged battery, comprising:

a battery source for powering a battery-powered device;

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an apparatus for performing program instructions, comprising:

a processor capable of performing control functions;

a processor-controlled analog-to-digital converter interconnected to said battery via an interface comprised of at least one of one or more input/output ports accessible to a plurality of conductors and contacts of a connector assembly, said interface being so configured as to provide a means of controllably electrically coupling at least one of one or more resistive elements as a temporary electrical preloading of said battery for outputting to said analog-to-digital converter at least one minimum battery voltage, instead of a previous outputting of at least one maximum battery voltage;

a memory accessible to said processor for storing voltage values acquired by said analog-to-digital converter;

a computer-readable medium including a look-up table, also stored in said memory, comprising a substantial matrix of battery design parameters expressed as voltage values of a multiplicity of batteries arranged by both chemistry type and typical cells-per-pack configurations;

said computer-readable medium including program instructions for configuring said processor to perform a first comparing of the acquired maximum voltage value to each maximum design voltage value from said look-up table, and further

including program instructions for configuring said processor to perform a second comparing of the acquired minimum voltage value to each minimum design voltage value from said look-up table,

whereby said first comparing results in said acquired maximum voltage value being excessively elevated as compared to said maximum design voltage values from said look-up table, thereby determining said anticipated fully-charged battery, and

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whereby said second comparing results in said acquired minimum voltage value being excessively depressed when as compared to said minimum design voltage values from said look-up table, thereby determining said anticipated nearly-discharged battery.

22. The determining of an anticipated fully charged or nearly discharged battery of claim 21, wherein said determining is performed prior to the execution of further program instructions for configuring said processor to output a first voltage value to a configurable power supply.

23. The look-up table of claim 21, wherein all indicated values are recalibrated to compensate for an additional load of a diode electrically coupled to conductors of a receptacle of said connector assembly, said receptacle interface being located along the housing of said battery.

24. The connector assembly of claim 21, further including a selectively user-positionable connector plug which, in a first position, transfers electrical signals between said apparatus and said battery, instead of being in a second position for transferring signals between said apparatus and said battery-powered device.

25. The selectively user-positionable connector plug of claim 24, further including program instructions for configuring a processor to generate at least one of one or more visual indicia to a user, thereby prompting said user to manipulate said connector plug so that its contacts now transfer signals between said apparatus and said battery powered device.

26. The transfer of electrical signals between said apparatus and said battery-powered device of claim 24, further including in said apparatus and battery-powered device a means of inter-device communications for transferring signals.

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27. The means of inter-device communications of claim 26, further including additional program instructions for configuring processors of said apparatus and of said battery-powered device respectively to transfer data signals by at least one communications medium selected from the group consisting of powerline modulation, and wireless infrared, and serial/parallel data protocols.

28. The acquired minimum and maximum battery voltage values of claim 21, wherein said values are retained in memory for use in further program instructions to configure said processor for calculating a voltage that represents at least a first output value of a processor-configurable variable-output power supply.

29. The computer-readable medium of the apparatus of claim 21, wherein said program instructions and requisite hardware to execute the instructions are embedded into aircraft systems.

30. The computer-readable medium of the apparatus of claim 21, wherein said program instructions and related hardware of said apparatus are incorporated into a discrete modular apparatus for interconnecting in-line between an external power-conversion adapter and said battery of said powered device.

31. The apparatus of claim 21, wherein said apparatus is embedded, and said program instructions are written to operate in an embedded environment.

32. The computer-readable medium of claim 21, wherein said program instructions configure said processor to acquire said maximum battery voltage value prior to acquiring said minimum battery voltage value, in order to take advantage of a known recovery capability of said battery.

33. The computer-readable medium of claim 21, wherein said program instructions configure said processor to control a switch located in said circuit between said analog-to-digital converter and said battery, for selectively electrically coupling into the circuit at least one of one or more resistive elements.

34. An apparatus for determining the chemistry-type of a battery, comprising:

a general-purpose processor capable of accessing an analog-to-digital converter for acquiring voltage values of said battery;

a means of interconnecting said battery to said A/D converter including a receptacle at said battery for mating to a user-positionable connector plug;

a memory to which said processor writes:

an acquired first value expressing a maximum output-voltage of said battery in a no-load condition;

a second value being retrieved from a look-up table comprising a substantial matrix of predetermined battery design parameters expressed as both maximum- and minimum-voltage reference values for a multiplicity of battery cells-per-pack configurations arranged by chemistry types;

a computer-readable medium embodying program instructions for configuring said processor for performing a comparing of the acquired first value to the retrieved second value as a maximum-voltage reference value, and

said processor analyzes the results of said comparing by determining whether said acquired first value is within a predetermined tolerance range of voltage variance when compared to the retrieved maximum-voltage reference value, thereby said analyzing resulting in either:

accepting said comparing as confirming that both voltage values are substantially the same, whereupon said processor writes both values to memory, or

rejecting said comparing because said acquired first value falls outside said predetermined tolerance range of voltage variance when compared to said retrieved maximum-voltage reference value, whereupon said processor discards the rejected maximum-voltage reference value and then retrieves from among the previously unselected maximum-voltage values in said look-up table another reference value for repeating said comparing and analyzing functions;

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said retrieving, comparing and analyzing functions repeat until said analyzing results in an accepting of both the acquired first and retrieved maximum-voltage reference values, and said processor writes both values to memory;

a means of electrically engaging at least one of one or more resistive elements as a predetermined electrical pre-load temporarily applied to said battery for said analog-to-digital converter acquiring from said battery a third value expressed as a minimum output-voltage, said processor then writing said acquired third value to memory;

further program instructions for configuring said processor for retrieving from said look-up table a fourth value expressing a predetermined minimum design voltage of a battery of the same cells-per-pack configuration and chemistry type as that of the previously accepted maximum-voltage reference value, said processor then writing the retrieved value to memory as a minimum-voltage reference value;

additional program instructions for configuring said processor for performing a comparing of the acquired third value to the retrieved minimum-voltage reference value;

further program instructions for configuring said processor for analyzing the results of said comparing by determining whether said acquired third value is within a predetermined tolerance range of voltage variance when compared to said retrieved minimum-voltage reference value, thereby said analyzing resulting in either:

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accepting said comparing as confirming that both values are substantially the same, whereupon said processor writes both values to memory, or

rejecting said comparing because said acquired third value falls outside said predetermined tolerance range of voltage variance when compared to said retrieved minimum-voltage reference value, whereupon said processor retrieves from among the previously unselected minimum-voltage reference values in said look-up table another reference value for repeating said comparing and analyzing functions;

said retrieving, comparing and analyzing operations repeat until said analyzing results in an accepting of both the acquired third and retrieved maximum-voltage reference values, and said processor writes both values to memory;

configuring said processor by further program instructions for executing a LIST function comprised of a compiling of the four previously accepted voltage values stored in memory, and

configuring said processor by additional program instructions for performing a SORT function upon the listed values by arranging the four previously accepted voltage values in ascending order,

whereby resulting in only a correctly determined battery chemistry type from among those in said look-up table yielding sorted values listed in a specific sequential order consisting of:

first, the retrieved minimum-voltage reference value;
second, the acquired minimum battery voltage value;
third, the acquired maximum battery voltage value, and
fourth, the maximum-voltage reference value.

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35. The means of interconnecting said battery to said A/D converter of claim 34, further including a diode strapped across contacts of said receptacle, resulting in said apparatus having access to both said battery and said powered-device, whereby the need for the connector plug to be user-positionable is eliminated.

36. The look-up table of claim 34, further including a charge rate for each battery chemistry type as a variable in a processor calculation to determine an impedance value of said resistive element.

37. The sorting of a list of voltage values of claim 34, wherein an acquired maximum-voltage value that varies significantly from said predetermined battery design parameter because said battery being fully charged causes it to output an excessively elevated maximum voltage, said acquired maximum-voltage value is adjusted by the predetermined tolerance range of voltage variance being calculated into said maximum-voltage value prior to said sorting.

38. The sorting of a list of voltage values of claim 34, wherein an acquired minimum-voltage value that varies significantly from said predetermined battery design parameter because said battery being nearly discharged causes it to output an excessively low minimum voltage, said acquired minimum-voltage value is adjusted by the predetermined tolerance range of voltage variance being calculated into said minimum-voltage value prior to said sorting.

39. An apparatus for employing electrical load values in determining various machine states of a user-interactive apparatus for delivering power to a battery-powered device, comprising:

a power-delivery apparatus comprising:

a general-purpose processor accessible to a memory and an analog-to-digital converter, said converter for acquiring electrical load and voltage values along a circuit which is configurable by an anticipated user-interactive attaching of a plurality of device-interconnecting elements consisting of a power cord, a positionable connector plug for attaching thereto, and a removable connector plug cover, each user-attachable element being itemized in a look-up table that further also lists a corresponding predetermined electrical load value thereof;

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said user-attachable elements being sequentially engageable to close said circuit, thereby electrically coupling said apparatus selectively to either a battery or said battery-powered device;

a power supply capable of a multiplicity of output voltages, being configurable by said processor executing program instructions embodied on a computer-readable medium;

said program instructions resulting in at least the following principle machine states of said apparatus:

a first machine state, wherein said processor shuts down said power supply prior to said analog-to-digital converter polling said circuit for the presence of a voltage signal for determining if said battery has erroneously been prematurely electrically coupled to said apparatus;

a second machine state, wherein said processor configures said power supply to output a low-voltage signal along said circuit for enabling said analog-to-digital converter to acquire electrical current values;

a third machine state, whereupon said processor compares each acquired current value to the predetermined load values in said look-up table, as a process for monitoring said user sequentially attaching each of said device-interconnecting elements, the attaching sequence also being defined in said look-up table as a series of changes in machine states, comprising:

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a fourth machine state, being a user attaching one terminus of said power cord to a port of said apparatus, said power cord designed to conform to a predetermined load value that corresponds to this particular configuration of said apparatus as defined in said look-up table;

a fifth machine state, as said user attaching said connector plug to the other terminus of said power cord, said connector plug designed to conform to a predetermined load value that corresponds to this particular configuration of said apparatus as defined in said look-up table;

a sixth machine state, being said user removing said connector plug cover, said cover incorporating a resistive element that conforms to a predetermined load value that corresponds to this particular configuration of said apparatus as defined in said look-up table, and

whereupon, during each user-attaching of the inter-connecting elements in the preceding fourth, fifth, and sixth machine states, additional machine states occur, in which program instructions configure said processor, power supply, and analog-to-digital

converter for acquiring a load value from along the circuit, the acquired load value then being compared to a predetermined load value representing the impedance of each of said device-interconnecting elements listed in said look-up table, thus confirming that said user is properly performing said attaching sequence;

a seventh machine state, as said user inserting said connector plug, in its first of two available positions, into a mating receptacle at said battery, thereby closing the previously open circuit between said apparatus and said battery;

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an eighth machine state, in which program instructions configure said processor and analog-to-digital converter for polling along the now-closed circuit for the presence of a line voltage, whereby detecting voltage confirms that said user has inserted said connector plug in its first selectable position, resulting in said apparatus being electrically coupled to said battery, instead of said user mistakenly selecting a second connector plug position, which would erroneously result in coupling said apparatus to said powered device;

a ninth machine state, wherein said processor acquires a battery voltage;

a tenth machine state, wherein the acquired battery voltage provides said processor with a value for replacing a maximum-voltage variable in said look-up table, the maximum-battery-voltage value being stored in memory;

an eleventh machine state, wherein a means of temporarily introducing a predetermined load into the circuit for providing said processor with a voltage value acquired from said battery for replacing a minimum-voltage variable in said look-up table, the resulting minimum-battery-voltage value being stored in memory;

a means of prompting said user to again manipulate said connector plug to its second position, thereby reconfiguring said circuit, as a twelfth machine state;

a thirteenth machine state, wherein said analog-to-digital converter polls said circuit for a voltage signal, the absence of said voltage signal confirming that said user has successfully manipulated said connector plug to its second position;

a fourteenth machine state, wherein said processor configures said power supply to output a low-voltage signal, thereupon enabling said analog-to-digital converter to acquire a current value along said circuit;

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a fifteenth machine state, wherein said processor analyzes the acquired current value as representing a total cumulative load attributable to a combination of said resistive elements introduced in the previous fourth through sixth machine states, plus an additional load value attributable to an anticipated electrical load generated by the internal circuitry of the now-connected battery-powered device, the presence of said additional load being an indicator confirming that said battery, while still mechanically attached along the reconfigured circuit, is electrically bypassed and, instead, said powered device is now electrically coupled to said apparatus, and

a sixteenth machine state being a determining-means for said processor to configure an initial output voltage of said power supply,

whereby, as a seventeenth machine state, said power supply delivers the previously determined initial output voltage to said powered device.

40. The connector plug of claim 39, further including a device for controlling the direction of electrical flow being incorporated into said mating receptacle at said battery, whereby said apparatus is accessible to both said battery and powered device, instead of to only either said battery or said powered device and, whereby

indicia and program instructions for prompting a user to reposition said connector plug are eliminated and, further whereby a user can enjoy the convenience of simply plugging in without further distractions or interactions.

41. The device for controlling the direction of electrical flow of claim 40, further including a bleed resistor in parallel to said device for controlling the direction of electrical flow, for an analog-to-digital converter acquiring non-suppressed battery voltage values, whereby a recalibration of all pre-determined minimum voltage values in a look-up table is eliminated.

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42. The look-up table of claim 39, further including anticipated machine states arranged in a matrix of fixed and variable resistive values that correspond to specific identified hardware elements of said apparatus in combinations and assemblages thereof, so that program instructions that require said processor to access said look-up table identifies not only said anticipated machine states, but also determine existing and anticipated combinations of said hardware elements, as well as determining a present position of a user-positionable connector plug, by simply acquiring a load value at any time during the execution of said program instructions, said processor then comparing said acquired value to those listed in said look-up table, thereby facilitating the proper execution of said program instructions, as well as minimizing error conditions.

43. The hardware elements in the look-up table of claim 42, wherein said hardware elements are manipulated at the time of design or manufacture to consistently exhibit the pre-determined specific fixed resistive values identified in said look-up table.

44. The look-up table of claim 42, wherein program instructions for a processor use at least one acquired load value, in conjunction with other load and voltage values that are acquired, as well as those values listed in said look-up table, to

perform calculations and analyses for determining whether a powered device is in either its OFF or ON state.

45. The look-up table of claim 39, further including line-load values that distinguishably differentiate two machine states:

one being a state in which said battery that is electrically coupled to said apparatus is mechanically detached from the battery's associated battery-powered device, while

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the other state being that in which said battery is mechanically attached to said battery-powered device.

46. The program instructions of claim 39, further including a sub-set of said program instructions for configuring said processor for executing a sub-routine that continuously loops a sequence comprising:

first, said processor configuring said analog-to-digital converter to acquire a line-voltage value from along said circuit, then

second, said processor then reconfiguring the converter and said power supply to acquire a line-load value from along said circuit, and

a timing rate for repeating said sub-routine being adjusted by said program instructions to said processor, based on an identified machine state.

47. The timing rate of claim 46, wherein said identified machine state includes a period of time after said processor has issued a prompt to a user, during which said processor waits for said user is to perform an anticipated action, the amount of wait-time being factored into program instructions of a processor-function for adjusting said timing rate.

48. The adjusting of the timing rate of claim 47, further including extending said wait-time, because said processor has no available means of issuing prompts to said user.

49. The anticipated electrical load generated by the internal circuitry of a connected battery-powered device of claim 39, wherein said anticipated load is substantially comprised of an aggregate impedance value attributable to all internal circuitry and elements thereof that collectively constitute all or part of a conductive path that terminates at said device's ON/OFF switch when said device is in an OFF state, said conductive path being accessible to said apparatus when attached to electrical contacts for interfacing to a battery of said battery-powered device.

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50. The computer-readable medium of the apparatus of claim 39, wherein said program instructions and related hardware of said apparatus are incorporated into a battery pack.

51. The apparatus of claim 39, wherein said apparatus is embedded, and said program instructions are written to operate in an embedded environment.

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52. A computer readable medium embodying program instructions for supplying power to a powered device which is adapted to receive power selectably from a battery and a configurable power supply, comprising:

preloading said battery with a resistive load;

varying said resistive load on said battery;

detecting the extent of voltage sag upon preloading said battery, and

analyzing said detected voltage sag and determining the anticipated fully charged battery voltage,

thereby supplying the appropriate voltage to the powered device from said configurable power supply, instead of from said battery.

53. A method of determining an anticipated fully charged or nearly discharged battery, comprising:

providing a battery source for powering a battery-powered device;

providing an apparatus for performing program instructions, comprising:

providing a processor capable of performing control functions;

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providing a processor-controlled analog-to-digital converter interconnected to said battery via an interface comprised of at least one of one or more input/output ports accessible to a plurality of conductors and contacts of a connector assembly, said interface being so configured as to provide a means of controllably electrically coupling at least one of one or more resistive elements as a temporary electrical preloading of said battery for outputting to said analog-to-digital converter at least one minimum battery voltage, instead of a previous outputting of at least one maximum battery voltage;

providing a memory accessible to said processor for storing voltage values acquired by said analog-to-digital converter;

providing a computer-readable medium including a look-up table, also stored in said memory, comprising a substantial matrix of battery design parameters expressed as voltage values of a multiplicity of batteries arranged by both chemistry type and typical cells-per-pack configurations;

said computer-readable medium including program instructions for configuring said processor to perform a first comparing of the acquired maximum voltage value to each maximum design voltage value from said look-up table, and further

including program instructions for configuring said processor to perform a second comparing of the acquired minimum voltage value to each minimum design voltage value from said look-up table,

whereby said first comparing results in said acquired maximum voltage value being excessively elevated as compared to said maximum design voltage values from said look-up table, thereby determining said anticipated fully-charged battery, and

whereby said second comparing results in said acquired minimum voltage value being excessively depressed when as compared to said minimum design voltage values from said look-up table, thereby determining said anticipated nearly-discharged battery.

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54. The method of claim 53, wherein excessively elevated or excessively depressed voltage values are compensated for by additional program instructions for configuring said processor for adjusting the excessive voltage values downward or upward respectively by a predetermined voltage tolerance amount, resulting in adjusted maximum- or minimum-voltage values that are available for other program instructions.

55. The temporary electrical preloading of claim 53, wherein at least one of said one or more resistive elements is a power resistor having an impedance value substantial enough to simulate an operational load of said battery-powered device.

56. The temporary electrical preloading of claim 53, wherein the resistive value of at least one of said one or more resistive elements is determined by the charge rate of a battery based on its chemistry-type, as expressed in a look-up table that lists batteries by chemistry types and charge rates.

57. The determining of a nearly-depleted battery of claim 53, wherein said excessively-depressed minimum voltage value can indicate a potentially unsafe battery.

58. The determining of a nearly-depleted battery of claim 57, wherein said determining further includes a notification of the battery condition to a user.

59. The notification of claim 38, wherein at least one means of notifying said user includes program instructions for configuring a processor to control a means of visually prompting said user as part of the apparatus.

60. The acquired maximum and minimum battery voltage values of claim 53, wherein said values are stored in memory to be accessed by further program instructions for configuring said processor for determining the power requirements of said powered device adapted to receive power selectably from said battery and said configurable power supply.

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61. The computer-readable medium of the apparatus of claim 53, wherein said program instructions and related hardware of said apparatus are incorporated into an external power-conversion adapter for interconnecting a source of power to said battery of said powered device.

62. The computer-readable medium of the apparatus of claim 53, wherein said program instructions and related hardware of said apparatus are incorporated into a battery pack.

63. A method of determining the chemistry-type of a battery, comprising:

providing a general-purpose processor capable of accessing an analog-to-digital converter for acquiring voltage values of said battery;

providing a means of interconnecting said battery to said A/D converter including a receptacle at said battery for mating to a user-positionable connector plug;

providing a memory to which said processor writes:

an acquired first value expressing a maximum output-voltage of said battery in a no-load condition;

a second value being retrieved from a look-up table comprising a substantial matrix of predetermined battery design parameters expressed as both maximum- and minimum-voltage reference values for a multiplicity of battery cells-per-pack configurations arranged by chemistry types;

providing a computer-readable medium embodying program instructions for configuring said processor for performing a comparing of the acquired first value to the retrieved second value as a maximum-voltage reference value,. and

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said processor analyzes the results of said comparing by determining whether said acquired first value is within a predetermined tolerance range of voltage variance when compared to the retrieved maximum-voltage reference value, thereby said analyzing resulting in either:

accepting said comparing as confirming that both voltage values are substantially the same, whereupon said processor writes both values to memory, or

rejecting said comparing because said acquired first value falls outside said predetermined tolerance range of voltage variance when compared to said retrieved maximum-voltage reference value, whereupon said processor discards the rejected maximum-voltage reference value and then retrieves from among the previously unselected maximum-voltage values in said look-up table another reference value for repeating said comparing and analyzing functions;

said retrieving, comparing and analyzing functions repeat until said analyzing results in an accepting of both the acquired first and retrieved maximum-voltage reference values, and said processor writes both values to memory;

providing a means of electrically engaging at least one of one or more resistive elements as a predetermined electrical pre-load temporarily applied to said battery for

said analog-to-digital converter acquiring from said battery a third value expressed as a minimum output-voltage, said processor then writing said acquired third value to memory;

providing further program instructions for configuring said processor for retrieving from said look-up table a fourth value expressing a predetermined minimum design voltage of a battery of the same cells-per-pack configuration and chemistry type as that of the previously accepted maximum-voltage reference value, said processor then writing the retrieved value to memory as a minimum-voltage reference value;

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providing additional program instructions for configuring said processor for performing a comparing of the acquired third value to the retrieved minimum-voltage reference value;

providing further program instructions for configuring said processor for analyzing the results of said comparing by determining whether said acquired third value is within a predetermined tolerance range of voltage variance when compared to said retrieved minimum-voltage reference value, thereby said analyzing resulting in either:

> accepting said comparing as confirming that both values are substantially the same, whereupon said processor writes both values to memory, or
>
> rejecting said comparing because said acquired third value falls outside said predetermined tolerance range of voltage variance when compared to said retrieved minimum-voltage reference value, whereupon said processor retrieves from among the previously unselected minimum-voltage reference values in said look-up table another reference value for repeating said comparing and analyzing functions;

said retrieving, comparing and analyzing operations repeat until said analyzing results in an accepting of both the acquired third and retrieved maximum-voltage reference values, and said processor writes both values to memory;

configuring said processor by further program instructions for executing a LIST function comprised of a compiling of the four previously accepted voltage values stored in memory, and

configuring said processor by additional program instructions for performing a SORT function upon the listed values by arranging the four previously accepted voltage values in ascending order,

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whereby resulting in only a correctly determined battery chemistry type from among those in said look-up table yielding sorted values listed in a specific sequential order consisting of:

first, the retrieved minimum-voltage reference value;
second, the acquired minimum battery voltage value;
third, the acquired maximum battery voltage value, and
fourth, the maximum-voltage reference value.

64. The receptacle for mating to a user-positionable connector plug of claim 63, wherein the connector plug includes a fist position for enabling access of said apparatus to said battery, and a second position for enabling access of said apparatus to said powered device.

65. The look-up table of claim 63, wherein wherein all indicated resistive values are recalibrated to compensate for an additional load of a diode that controls the direction of electrical flow of said battery's power output signals, said diode being electrically coupled to conductors of a receptacle of said connector assembly, said receptacle's accessible interface being located along the housing of said battery.

66. The matrix of predetermined battery design parameters of claim 63, wherein said predetermined design parameters substantially represent industry standard values for charge rates, minimum and maximum voltages of individual battery cells, as well as typical battery pack configurations for at least one identifiable category of battery-powered devices.

67. The category of battery-powered devices of claim 66, wherein said category is derived from analyzing battery voltages and the typical number of cells normally required to power a particular group of substantially similar devices.

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68. The predetermined tolerance range of voltage variance of claim 63, wherein said tolerance range allows for voltage variances caused by either fully-charged or nearly discharged batteries.

69. A method of employing electrical load values in determining various machine states of a user-interactive apparatus for delivering power to a battery-powered device, comprising:

providing a power-delivery apparatus comprising:

providing a general-purpose processor accessible to a memory and an analog-to-digital converter, said converter for acquiring electrical load and voltage values along a circuit which is configurable by an anticipated user-interactive attaching of a plurality of device-interconnecting elements consisting of a power cord, a positionable connector plug for attaching thereto, and a removable connector plug cover, each user-attachable element being itemized in a look-up table that further also lists a corresponding predetermined electrical load value thereof;

said user-attachable elements being sequentially engageable to close said circuit, thereby electrically coupling said apparatus selectively to either a battery or said battery-powered device;

providing a power supply capable of a multiplicity of output voltages, being configurable by said processor executing program instructions embodied on a computer-readable medium;

said program instructions resulting in at least the following principle machine states of said apparatus:

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providing a first machine state, wherein said processor shuts down said power supply prior to said analog-to-digital converter polling said circuit for the presence of a voltage signal for determining if said battery has erroneously been prematurely electrically coupled to said apparatus;

providing a second machine state, wherein said processor configures said power supply to output a low-voltage signal along said circuit for enabling said analog-to-digital converter to acquire electrical current values;

providing a third machine state, whereupon said processor compares each acquired current value to the predetermined load values in said look-up table, as a process for monitoring said user sequentially attaching each of said device-interconnecting elements, the attaching sequence also being defined in said look-up table as a series of changes in machine states, comprising:

providing a fourth machine state, being a user attaching one terminus of said power cord to a port of said apparatus, said power cord designed to conform to a predetermined load value that corresponds to this particular configuration of said apparatus as defined in said look-up table;

providing a fifth machine state, as said user attaching said connector plug to the other terminus of said power cord, said connector plug designed to conform to a predetermined load value that corresponds to this particular configuration of said apparatus as defined in said look-up table;

providing a sixth machine state, being said user removing said connector plug cover, said cover incorporating a resistive element that conforms to a predetermined load value that corresponds to this particular configuration of said apparatus as defined in said look-up table, and

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whereupon, during each user-attaching of the inter-connecting elements in the preceding fourth, fifth, and sixth machine states, additional machine states occur, in which program instructions configure said processor, power supply, and analog-to-digital converter for acquiring a load value from along the circuit, the acquired load value then being compared to a predetermined load value representing the impedance of each of said device-interconnecting elements listed in said look-up table, thus confirming that said user is properly performing said attaching sequence;

providing a seventh machine state, as said user inserting said connector plug, in its first of two available positions, into a mating receptacle at said battery, thereby closing the previously open circuit between said apparatus and said battery;

providing an eighth machine state, in which program instructions configure said processor and analog-to-digital converter for polling along the now-closed circuit for the presence of a line voltage, whereby detecting voltage confirms that said user has inserted said connector plug in its first selectable

position, resulting in said apparatus being electrically coupled to said battery, instead of said user mistakenly selecting a second connector plug position, which would erroneously result in coupling said apparatus to said powered device;

providing a ninth machine state, wherein said processor acquires a battery voltage;

providing a tenth machine state, wherein the acquired battery voltage provides said processor with a value for replacing a maximum-voltage variable in said look-up table, the maximum-battery-voltage value being stored in memory;

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providing an eleventh machine state, wherein a means of temporarily introducing a predetermined load into the circuit for providing said processor with a voltage value acquired from said battery for replacing a minimum-voltage variable in said look-up table, the resulting minimum-battery-voltage value being stored in memory;

providing a means of prompting said user to again manipulate said connector plug to its second position, thereby reconfiguring said circuit, as a twelfth machine state;

providing a thirteenth machine state, wherein said analog-to-digital converter polls said circuit for a voltage signal, the absence of said voltage signal confirming that said user has successfully manipulated said connector plug to its second position;

providing a fourteenth machine state, wherein said processor configures said power supply to output a low-voltage signal, thereupon enabling said analog-to-digital converter to acquire a current value along said circuit;

providing a fifteenth machine state, wherein said processor analyzes the acquired current value as representing a total cumulative load attributable to a

combination of said resistive elements introduced in the previous fourth through sixth machine states, plus an additional load value attributable to an anticipated electrical load generated by the internal circuitry of the now-connected powered device, the presence of said additional load being an indicator confirming that said battery, while still mechanically attached along the reconfigured circuit, is electrically bypassed and, instead, said powered device is now electrically coupled to said apparatus, and

providing a sixteenth machine state being a determining-means for said processor to configure an initial output voltage of said power supply,

M whereby, as a seventeenth machine state, said power supply delivers the previously determined initial output voltage to said powered device.

70. The acquiring of a current value along the circuit of the fourteenth machine state of claim 69, wherein said circuit includes a connector receptacle located in a battery pack that is wired directly to a battery cell cluster, thereby eliminating from the acquired current value any indeterminate load factor caused by pre-existing circuitry, and other resistive elements thereto, internal to said battery pack.

71. The computer-readable medium of the apparatus of claim 69, wherein said program instructions and related hardware of said apparatus are incorporated into a discrete modular apparatus for interconnecting in-line between an external power-conversion adapter and said battery of said powered device.

72. The computer-readable medium of the apparatus of claim 69, wherein said program instructions and related hardware of said apparatus are incorporated into an external power-conversion adapter for interconnecting a source of power to said battery of said powered device.

73. The apparatus of claim 69, wherein said apparatus is part of an embedded system having a power cord is incorporated into a retractor reel assembly that mounts in a

location near a user workspace, so that a user can conveniently stow said power cord when not accessing said embedded apparatus, and a load value in a look-up table is adjusted to reflect a changed impedance value of the retractable power cord.

74. The connector plug assembly of claim 69, wherein said connector plug is not removable from said power cord, and said look-up table is adjusted to represent a new load value of these combined elements.

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75. The acquiring of electrical load and voltage values of claim 69, further including a plurality of input/output ports accessible to said analog-to-digital converter, at least one of the ports for acquiring voltage values being reconfigurable by program instructions that direct a processor to manipulate a controllable switch that electrically couples at least one of one or more resistive elements to said port, whereby said port is reconfigured for acquiring current values.

76. The at least one resistive element of claim 75, wherein said resistive element exhibits an impedance value based on a charge rate of a discoverable chemistry-type of a battery, whereby program instructions configure said processor for analyzing identified battery chemistry types from a look-up table that lists battery charge rates as values for use by said processor in determining the impedance value required of said resistive element.

77. The method of employing electrical load values of claim 69, wherein said program instructions for configuring said processor for acquiring load values includes instructions that support both point-count and actual-values methodologies of determining said load values.

78. A method for determining the power requirements of a powered device adapted to receive power selectably from a battery and a configurable power supply, comprising:

preloading said battery with a resistive load;

varying said resistive load on said battery;

detecting the extent of voltage sag upon preloading said battery, and

analyzing said detected voltage sag and determining the anticipated fully charged battery voltage,

A1 cont'd

thereby supplying the appropriate voltage to the powered device from said configurable power supply, instead of from said battery.

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This Supplemental Amendment was faxed to (703) 746-5402 on 20 November 2002, and the original was mailed via Express Mail on 20 November 2002.

Respectfully submitted,

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